REMARKS

In the Office Action dated February 6, 2004, the Examiner noted that reference numeral 7 in Figure 1 did not indicate a liquid medium, as stated in the specification. Figure 1 has been amended to delete the original location of reference numeral 31 and its associated lead line, and to employ reference numeral 31 at the original location of reference numeral 7, so that reference numeral 31 more clearly indicates the x-ray beam, as stated in the specification. Reference numeral 7 and its associated lead line have been moved to a location so that reference numeral 7 clearly indicates the liquid medium, as also stated in the specification.

The typographical error noted by the Examiner in the specification has been corrected.

Claim 2 was objected to because the Examiner stated the structure defined by "apparatus components" was not clear. Claim 2 has been revised to state that the housing contains the acoustic transducer, which is set forth in independent claim 1, and this is believed to overcome this objection. The typographical error noted in claim 2 also has been corrected.

Claims 1-10 were rejected under Section 112, first paragraph, as failing to comply with the enablement requirement. The Examiner stated it is unclear how the acoustic transducer is transparent to x-rays when the only disclosed materials for the electrodes are aluminum and stainless steel, which are both know to be radiopaque. Claims 1-10 were rejected under 35 U.S.C. §101 because the Examiner stated the disclosed invention is inoperative and therefore lacks utility, for the same reason has formed the basis for the rejection under Section 112, first paragraph.

These rejections are respectfully traversed because the materials disclosed for the electrodes (aluminum and stainless steel) are not inherently radiopaque, such as lead, but are only radiopaque when having a certain thickness in the direction of x-ray propagation. The specification describes these electrodes as being extremely thin, such as having a thickness in the micrometer range (see claim 3, for example) Aluminum and stainless steel, when made so thin, are in fact transparent to x-rays even though they may very slightly attenuate the x-rays. The amount of attenuation resulting from a stainless steel or aluminum electrode having such a thin structure is negligible, and therefore it is accurate to characterize the electrodes as being transparent to x-rays.

This feature is central to the novelty and non-obviousness of the subject matter disclosed and claimed in the present application. Claims 1-4, 8 and 9 were rejected under 35 U.S.C. §103(a) as being unpatentable over Hartmann et al in view of Rattner '804 or Herrmann et al. Claim 5-7 and 10 were rejected under 35 U.S.C. §103(a) as being unpatentable over this combination, further in view of Peterson et al.

In the Hartmann et al reference, the electrode that functions as the membrane, namely the electrode directly adjacent to the propagation medium, is thin, as is necessary for the electrode to perform the function of a membrane. By contrast, the other electrode in the Hartmann et al reference is rigid and fixed and has a substantially larger thickness than the electrode that functions as the membrane. Given the thickness of this electrode (i.e., the electrode not functioning as the membrane) it cannot be considered as being transparent to x-rays, for the reasons noted by the Examiner in connection with the rejections under Section 112

and Section 101. If a person of ordinary skill in the art desired to make the shockwave source disclosed in Hartmann et al transparent to x-rays, such a person would be taught by Hermann et al and Rattner '804 to make a hole or opening in the overall acoustic transducer structure, so as to allow the passage of x-rays through the opening, or to allow some other source, such as an ultrasound source, to be placed in the opening. Having such an opening in the acoustic transducer is problematical in terms of forming the components as well as in terms of maintaining the necessary fluid-tight seal to prevent leakage of the propagation medium.

The subject matter disclosed and claimed in the present application provides an x-ray transparent acoustic transducer by virtue of making both of the electrodes sufficiently thin so that, regardless of their material, they are transparent to x-rays, and instead of the thick, x-ray attenuating electrode which is taught in the Hartmann et al reference, a carrier is provided for the thin electrode, the carrier being composed of x-ray transparent; material. Since the carrier does not have to perform an electrode function, it can be made relatively thick, in order to provide the necessary mechanical support, but it can be made of x-ray transparent material, such as plastic.

The inventive structure, therefore, allows an acoustic transducer to be constructed that is transparent to x-rays, without the necessity of providing openings in the electrodes and/or the electrode carrier. This not only has the advantages described above, but also allows the use of a conventional x-ray source with the acoustic transducer, rather than a specially designed or specially shaped x-ray source as is necessary for use in acoustic transducers having an opening therein for allowing the passage of x-rays.

Claim 1 has been amended to affirmatively claim the aforementioned carrier, and to state that the carrier is composed of a material that is transparent to x-rays, and has further been amended to make clear that it is the thickness of each of the first and second electrodes that makes them transparent to x-rays.

None of the Hartmann et al, Rattner '804 or Herrmann et al references discloses or suggests making an acoustic transducer transparent to x-rays by making the electrodes, which necessarily must be composed of electrically conductive material, with a thickness that allows them to be transparent to x-rays. None of claims 1-4, 8 or 9, therefore, would have been obvious to a person of ordinary skill in the field of acoustic transducer design under the provisions of 35 U.S.C. §103(a) based on the teachings of those references.

The Peterson et al reference, relied upon in combination with the above references as a basis for rejecting claims 5-7 and 10, is evidence of the non-obviousness of the subject matter of those claims, rather than the obviousness thereof. As the Examiner has noted, the Peterson et al reference discloses transducer electrodes made from either stainless steel or aluminum, however, in view of the conventional thicknesses employed for such electrodes, this would deter a person of ordinary skill in the field of acoustic transducer design, wanting to make an x-ray transparent acoustic transducer, from using stainless steel or aluminum as the electrode material. Only the present inventors have found a way to use conventional materials for the electrodes, while still making the overall acoustic transducer transparent to x-rays, without the need for complicated shaping of the components. None of claims 5-7 or 10, therefore, would have been obvious to a

person of ordinary skill in the field of acoustic transducer design based on the teachings of Hartmann et al, Rattner '804, Herrmann et al and Peterson et al.

All claims of the application are submitted to be patentable over the teachings of the above references, taken singly or in combination. Early reconsideration of the application is respectfully requested.

Submitted by,

Steven H. Noll (Reg. 28,982)

SCHIFF, HARDIN LLP
CUSTOMER NO. 26574
Patent Department
6600 Sears Tower
233 South Wacker Drive
Chicago, Illinois 60606
Telephone: 312/258-5790
Attorneys for Applicant.

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